Maryland Artist/Teacher Institute

Arts Integrated Lesson Plan

ART FORM:
Dance

SUBJECT AREA:
Science

Lesson Title:	Grade:
Moving through the states of matter	6
Contributor, School:	Time Frame:
Jennifer Smith, Bates Middle School	Two 80-minute sessions

State Curriculum Content Standards, Indicators, Objectives

Dance Content Standard(s)	**Science Content Standard**
3.0 Creative Expression and Production: Students will demonstrate the ability to create and perform dance. 4.0 Aesthetics and Criticism: Students will demonstrate the ability to make aesthetic judgments in dance.	4.0 Chemistry Students will use scientific skills and processes to explain the composition, structure, and interactions of matter in order to support the predictability of structure and energy transformations. Topic C: States of Matter
Dance Content Indicators(s)	**Science Content Indicator**
3.2 Develop the ability to select and combine the elements, aesthetic principles, and choreographic forms of dance to communicate meaning. 4.1 Identify, analyze, and apply criteria to evaluate choreography and performance.	4.C.1 Provide evidence and examples illustrating that many substances can exist as a solid, liquid, or gas depending on temperature.
Fine Arts Objective(s)	**Science Content Objective(s)**
3.2.b Create movement sequences by selecting and using choreographic forms to support ideas or themes. 4.1.b Select and use criteria to critique personal performances, improvised and choreographed, and the performance of others	4.C.1.a Use evidence from investigations to describe the effect that adding heat energy to different types of matter has on changing matter from one state to another. 4.C.1.b Based on data from investigations describe the effect that removing heat energy from different types of matter has on changing matter from one state to another

Objective(s) (Connecting the content areas)

Students will create and perform a dance to describe the movement of molecules as matter changes state.

Key Arts Vocabulary	**Key Science Vocabulary**
• *sustained movement*—Movement that is the result of a steady, equalized release of energy. There is a feeling of even tension and uninterrupted continuousness. • *vibratory movement*—Sharp, aggressive movements that recur in	• *solid, liquid, gas, molecule, atom, heat, temperature, freezing, melting, evaporation, condensation*

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quick succession, with a quivering, shaking pulsating result. • *locomotor movement*, *non-locomotor movement*, *AB form, improvisation, improvise, time*	

Prior Knowledge Students Need for This Lesson

Arts	**Science**
• Elements of dance • Moving while using many aspects of the elements of dance • Concept of moving in general space	• The fact that all things are made of matter • Comparison and contrast of thinking maps

Materials and Resources

Materials and Resources for the Class	**Materials and Resources for the Teacher**
• *Marble* • *Bottle of cooking oil* • *Air-filled balloon* • *Empty jar* • *Rock* • *Silly putty* • *Flour* • *Penny* • *Can of soda* • *Pen* • *Textbooks* • *Elements of dance handout* • *Paper* • *Pencils* • *Markers*	• *Textbook* • *Block of wood* • *Beaker* • *Water* • *Helium-filled balloon* • *Handout (elements of dance)* • *Document camera/overhead* • *Watch glass* • *Hot plate*

Lesson Development/Procedures (including motivation, modeling, guided practice, and independent practice)

Day 1

- Place on the document camera/overhead the following questions: What is matter? What is matter made of?
- Allow two minutes to answer the questions on sheets of paper and review the answers with the class as a prior knowledge assessment for this lesson.
- Hold up a block of wood. Ask students, “What is this?” “What is it made of?” (Response—matter) Share with the students that a block of wood is a solid.
- Hold up a beaker of water and tell the students that the beaker is filled with water. Ask them in what state of matter is water. (Response—liquid) Share that water is a liquid.
- Hold up a balloon. Ask the students what the balloon is filled with. (Response—helium) Share that helium is a gas.
- Explain that all matter exists as a solid (e.g., wood), a liquid (e.g., water), or a gas (e.g., helium).
- Have students take out a sheet of paper and number it from 1–10. Working with partners, the students are instructed to go to each of the lab tables, look at the item on the table, and write whether it is a

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solid, liquid, or gas. Items at numbered lab stations might include the items listed in the Materials and Resources for the Class section of this lesson. (The empty jar is a solid; inside the jar is a gas. The can of soda is a solid; inside the can is liquid. The pen is both a solid and a liquid.)

- After students circulate around the room for about five minutes and describe each item, review the correct answers.
- Review two of the possible energy components of dance as sustained and vibratory. Review the concept of improvisation. For each of these qualities of movement, review the definition and demonstrate or ask for student volunteers to improvise movement(s) in that quality.
- Review and demonstrate or ask for student volunteers to demonstrate the dance element of time in movement, focusing on movements that can be done fast, medium, or slow.
- Explain that all matter is made of tiny particles called atoms and molecules. Sometimes the molecules are very close together and move very slowly, and other times they are spread out and move very quickly.
- Hold up a rock, block of wood, or other solid. Ask students to close their eyes and imagine the molecules that make up the rock. Ask them to picture how they think the molecules are moving. Explain that in solids the molecules are tightly packed together and move very slowly. In fact, they just vibrate. Ask a section (equaling about a third of the class) to stand and improvise movements that represent the molecules in a solid—slightly vibrating.
- Hold up a beaker of water. Again, ask the students to close their eyes and imagine how the molecules in the liquid are moving. Explain that in a liquid there is little space between the molecules which move slowly and slide past one another. Instruct the second designated third of the class to move into general space and improvise the action of the liquid molecules, demonstrating the way liquid molecules move slowly and slide/glide past each other.
- Hold up a balloon. Tell students that in the gas state molecules move very quickly and there is a lot of space between molecules. Explain that gas molecules move so quickly that they often bump into each other and spread apart. Explain that in demonstrating this state of matter, caution must be taken when invading the self space of others, and the contact must be in a gentle and controlled manner. The final third of the students move into general space and demonstrate this state through movement.
- Students read the section in the textbook about the three states of matter.
- Divide the students into groups of three and pass out paper and markers. Each group is asked to develop a Thinking Map comparing and contrasting the three states of matter.

Day 2

- Review the action of the molecules in the three states and have the entire class improvise movements representing these states.
- After students return to their seats, demonstrate changes in a state of matter by melting an ice cube on a hot plate. Explain that the ice has changed from a solid to a liquid by adding heat energy. Ask students to describe the changes in the movement of the water molecules as the water changes from a solid to a liquid. (The ice molecules are tightly packed and hardly moving; but, when heat is added, the molecules spread apart and glide past one another).
- Heat the melted water until it evaporates. Ask the students what happened to the water. Explain that the water molecules change from liquid to a gas when the water disappears, or evaporates.
- Heat a pan of water on the hot plate and use tongs to hold a watch glass over the steam. The steam will condense on the watch glass. Explain that the condensation is water that returns to a liquid state when it cools and changes from a gas back to a liquid.
- Summarize that with heating, matter can change its state from a solid to a liquid and from a liquid to a gas. With cooling, matter can change from a gas to a solid to a liquid and from a liquid to a solid.
- Review the elements of dance through movement activities.
- Divide the students into groups of four or five with the objective of creating a dance that demonstrates the movement of molecules in a substance changing from one state to another.
- Explain that a designated form in dance is a way to structure a composition, as it does in music. The two-part compositional form AB should be used as a guide in composing this dance study with movements selected and presented as a group that depict one state of matter (A) changing into another state of matter (B). Students are expected to contribute movement ideas and respectfully listen to the ideas of others in creating this composition.

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- Share the rubric by which the group's presentation will be assessed. (See Assessment section of this lesson.)
- Circulate to each of the groups, providing assistance as needed.
- Following the sharing of guidelines for appropriate audience behavior, each group presents its dance to the class.
- After each group's presentation, students in the class will select criteria in the rubric to critique the performance.

Closure/Summary

Think of the movement(s) which you feel most accurately represented the concept of changing matter. Pair up with another person close to you and discuss, specifically, why you feel this way. Share the discussion with your partner with the class.

Assessment (Description/Tools)

- Thinking Maps from Day 1 will be collected and graded.
- Rubric for the dance:

	3	2	1
locomotor movements	dance includes one or more, and each is accurately performed	dance includes one or more, but some are not performed correctly	dance does not have any movements, and/or they are done incorrectly
non-locomotor movements	dance includes two or more movements, and all are performed correctly	dance includes one movement, and it is done correctly	dance includes one movement, but it is not performed correctly
shapes	a variety of shapes are included in the composition	there is some variety in the shapes presented	there is very little variety in the selected shapes
shows AB form and has a beginning, middle, and end	both the A and B themes are made clear by the selected movements, and the beginning, middle, and end are very evident	A and B themes are not as evident in the move-ments, but have a clear beginning, middle, and end	A and B themes are not evident; there is a middle and end
sounds	there are no sounds	there are a few sounds, but they do not impact the quality of the performance	students are making sounds that negatively impact the performance
accurate content	selected movements accurately depict the action of the molecules	selected movements somewhat depict the action of the molecules	selected movements are not accurate in depicting the action of the molecules
original	the dance is composed solely by the members of the group, or movements are combined and presented in a manner not seen previously	some of the movements are done by others in the class, but they are presented in a unique manner	the dance is composed of movements done by others with no unique combinations

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Lesson Extensions

- Draw a picture of the movement of molecules in each of the three states of matter.
- Write a poem comparing yurself to a state of matter.
- Write a poem or haiku using the vocabulary words.

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